

Introduction

Data breaches, large scale compromises of consumers' personal data, have taken the nation by storm over the past half decade. While studies have been conducted regarding consumer sentiment after being affected by a data breach, none have attempted to understand how data breaches impact consumer behavior. Focusing on three groups of consumers, those directly impacted by data breaches, those indirectly impacted, and those not impacted, the objective is to determine how the personal data security behaviors of the groups vary. Millions of consumers have been impacted by data breaches that cost organizations incredible amounts of money. The goal is to provide insight on how these consumers behaved in the past and how they behave now.



Research Methods

- Secondary Research**
 - Ponemon Institute Reports
 - Identity Theft Resource Center Reports
- 77-Question Qualtrics Survey**
 - 220 Survey Respondents
 - Screening to determine direct, indirect, or no experience with data breaches
 - Mixture of behavior-related and sentiment-related questions
- Chi-Square Analysis, Proportions, and ANOVA**
 - Chi-Square Analysis used to identify any differences among previous and current data security behaviors
 - Proportion analysis used to identify differences between groups on why they did or did not change behavior
 - ANOVA used to identify differences in emotions between groups

Example Questions

Do you change your passwords regularly?
Did you change your passwords regularly before hearing about data breaches?

Have you taken security measures with regards to debit cards?
Were these a result of data breaches?

How vulnerable to identity theft do you feel at this moment in time?

Results

Hypothesis: Consumers who have been directly impacted by data breaches will take more precautions to protect their personal information than consumers who have been indirectly impacted or not impacted by data breaches.

Consumers not impacted by data breaches will have done less to protect their personal data and information.

Consumers indirectly impacted by data breaches may have taken actions to protect their personal data and information.

Consumers directly impacted by data breaches will have taken the most actions to protect their personal data and information.

Figure 1: Hypothesized Outcome for the 3 Groups

Chi-Square Analysis for Behaviors

Chi-Square Tests	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	.052 ^a	2	.974
Likelihood Ratio	.052	2	.974
Linear-by-Linear Association	.004	1	.948
N of Valid Cases	216		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 20.16.

Figure 2: Chi-Square Analysis of Password Changing

Chi-Square Tests	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.435 ^a	2	.296
Likelihood Ratio	2.480	2	.289
Linear-by-Linear Association	1.910	1	.167
N of Valid Cases	147		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.26.

Figure 3: Chi-Square Analysis of Debit Card Security

Chi-Square Tests	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6.641 ^a	2	.036
Likelihood Ratio	6.851	2	.033
Linear-by-Linear Association	6.540	1	.011
N of Valid Cases	216		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.73.

Figure 4: Chi-Square Analysis of SSN

Findings: There were no significant differences for most behaviors between the three groups.

Passwords	Y/Y	Y/N	N	Total # That Changed Behavior	% That Changed b/c of Data Breach
Directly	27	16	34	43	63%
Indirectly	25	15	34	40	63%
Not impacted	24	12	29	36	67%

Debit Cards	Y/Y	Y/N	N	Total # That Changed Behavior	% That Changed b/c of Data Breach
Directly	15	9	28	24	63%
Indirectly	10	13	28	23	43%
Not impacted	3	11	30	14	21%

SSN	Y/Y	Y/N	N	Total # That Changed Behavior	% That Changed b/c of Data Breach
Directly	3	58	16	61	5%
Indirectly	5	60	9	65	8%
Not impacted	5	56	4	61	8%

Security Service	Y/Y	Y/N	N	Total # That Changed Behavior	% That Changed b/c of Data Breach
Directly	6	11	60	17	35%
Indirectly	11	5	58	16	69%
Not impacted	5	2	58	7	71%

Figure 5: Proportion test for behavior decisions

Findings: Data breaches impacted why consumers changed behavior, but not in every case.

ANOVA Test for Sentiment and Emotions

At a 99.90% confidence interval there appear to be significant differences between the three consumer groups with regards to sentiment. However, not consistently, as is shown in the identity theft question.

		Sum of Squares	df	Mean Square	F	Sig.
How safe do you feel your personal information is at this moment in time?	Between Groups	3.199	2	1.600	3.634	.028
	Within Groups	93.759	213	.440		
	Total	96.958	215			
How threatened do you feel by hackers/data breaches at this moment in time?	Between Groups	3.058	2	1.529	2.825	.075
	Within Groups	124.035	213	.582		
	Total	127.093	215			
How vulnerable to identity theft do you feel at this moment in time?	Between Groups	2.519	2	1.260	2.725	.068
	Within Groups	98.476	213	.462		
	Total	100.995	215			
In general, how concerned are you about identity theft?	Between Groups	1.892	2	.946	.749	.474
	Within Groups	269.067	213	1.263		
	Total	270.958	215			

Findings: At a lower CI, data breaches appear to impact consumer emotions differently based on which of the three respondent categories they were in.

Discussion

- The data paints a very inconsistent picture for both consumer behavior and sentiment. However, for most behaviors there are no differences between groups.
- For the 6 behavior-related questions that could be analyzed with Chi-Square, only 1 yielded significant differences between groups.
 - Consumers varied in whether or not they provide SSNs to organizations
 - Consumers who were directly impacted by data breaches were still *more* likely to provide their SSNs than the two other groups
- For the 4 questions posed to determine whether a changed behavior was due to data breach impact, 2 had varying proportions.
 - Consumers directly impacted by data breaches changed their debit card behavior more than other groups
 - Consumers directly impacted by data breaches changed their personal data security service behavior less than other groups
- The survey data may show that feelings towards data security differ significantly across groups
 - Consumers felt different levels of safety, threat, and vulnerability based on their grouping according to ANOVA tests
 - However, this did not translate into their concern over identity theft

Conclusion

There is not significant evidence to support the notion that consumer behavior with regards to personal data and information security varies significantly based on previous experience, or lack thereof, with data breaches.

- Limitations**
 - Obtaining a racially diverse sample, a sample of those with significant financial or legal repercussions, and a sample of those without internet
 - Wording of questions was vague in an attempt to have all three groups answer the same questions
 - Lack of statistical testing for questions related to behavior changes
- Future Research**
 - Why differences in emotion are not translating to distinct differences in behavior

Acknowledgements

I owe the completion of this research to several people. Thank you all so much. Dr. Vasu Unnava, My Advisor and Consumer Packaged Goods Cluster Instructor Dr. Patricia West, Associate Dean for Undergraduate Programs (FCOB) and my Advisor My Honors Contract: Through Industry Clusters Classmates, Congratulations all!